



## Corner: J LCA Jpn (The Journal of Life Cycle Assessment, Japan)

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### *The Collaboration between Int J LCA and J LCA Jpn*

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The Institute of Life Cycle Assessment, Japan (ILCAJ) was established in October 2004. The goal of ILCAJ is to promote academic activities related to life-cycle thinking and to share expert knowledge with colleagues from wide-ranging backgrounds. Professor Ryoichi Yamamoto, University of Tokyo, has taken responsibility as Chairman of ILCAJ.

In April 2005, ILCAJ has successfully established its publication organ (in Japanese), The Journal of Life Cycle Assessment, Japan (J LCA Jpn). The issues appear every three months. J LCA Jpn publishes peer-reviewed research articles, commentaries & discussions, (technical) reports, lecture notes, and presentations of research groups in Japan, among other. In Int J LCA 12 (6) 348-350, we were happy to announce the collaboration between Int J

LCA and J LCA Jpn for the purpose of exchanging knowledge, new insights, experiences and information across the different languages. The **Corner: JLCA Jpn** aims to be a bridge between the LCA community of Japan and of the entire world.

All abstracts of **research articles** as well as **commentaries & discussions** published in J LCA Jpn will simultaneously appear in Int J LCA, Corner: JLCA Jpn, in order to introduce Japanese activities to our readers. In addition, some selected research papers from J LCA Jpn will be submitted to Int J LCA for publication following peer-review. We hope that this collaboration will stimulate the global exchange of information through professional pathways.

**The following abstracts were published in J LCA Jpn Vol. 3, No. 3 (July).**

## Commentary and Discussion

### Activities and Research Framework to 'Sustainable Consumption and Production'

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**Synopsis.** The sustainability of the future world depends on human beings' sound environmental stewardship – providing a quality of life, for a prospective nine billion people, without depleting natural resources or causing irreparable harm to natural systems. One of the outcomes of the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 was the call to promote and develop a 10-year Framework of Programmes on Sustainable Consumption and Production (SCP) in support of regional and national initiatives to accelerate the shift towards SCP. Research and development on environmentally-related issues, including life cycle assessment (LCA), were performed toward 'sustainable production', aiming at a reduc-

tion of environmental burden from industries. However, efforts to realize 'sustainable society' by implementing sustainable consumption – shifting on-going consumption patterns to a sustainable mode – are also important. In Europe, networks have been established among the researchers on SCP, and the development of research framework is being discussed. Research efforts focused on sustainable consumption that enhance an understanding of how to shift consumption patterns and on developing tools that can give feedback to the producers' side are necessary. A realization of sustainable society is possible by implementing both sustainable consumption and sustainable production, as both sides of the coin.

## Commentary and Discussion

### Introduction of Environmental Education for Consumer: Present Situation and Subjects

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**Synopsis.** The present situation and subjects of environmental education for consumers are summarized based on the investigation from primary, junior and senior high schools, school of education, consumer organization, company and municipal corporation in Japan over the last two years. Especially the education to students of primary to senior high schools is so important because they become main consumers in the near future, that results of investigation to these organizations of which are described in more detail in this paper.

The background of the environmental education for consumers is also mentioned in the context of development of the concepts of environmental education in about forty years by international organizations, and trend in Japan. In the paper, it is pointed out that the establishment of an environmental education system for consumers is urgently required for the development of environmental education for the consumer, as well as the development of more effective educational method and teaching materials and arrangement of places for education.

## Research Article

### Life Cycle CO<sub>2</sub> Assessment Associated with Model Menu in Japanese Households

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**Objective.** The study examined the volume of Life Cycle CO<sub>2</sub> emission from Japanese, Western and Chinese dishes that are daily consumed by the Japanese, especially comparing the volume of CO<sub>2</sub> emission depending upon a different cooking process. As the first step to examine a possibility of Japanese food stability, model menu was selected for home cooking with purchased ingredients and the environmental burden was evaluated by LC-CO<sub>2</sub> emission from cooking at home. Menus selected for the study were toasted bread and fried eggs for breakfast, Chinese noodles in soup for lunch, and three different styles of dinner; Japanese dishes (Dinner 1), Western dishes (Dinner 2) and Chinese dishes (Dinner 3). For each menu, LC-CO<sub>2</sub> emission from ingredients was calculated and LC-CO<sub>2</sub> emission from cooking was added, the total LC-CO<sub>2</sub> emission for the whole meal was then estimated.

**Results and Discussion.** CO<sub>2</sub> emission from cooking meals for one day was 1400 g CO<sub>2</sub> (average of 3 days), which was not a high level, but could affect the environment considering the number of households. The cooking methods producing the lowest LC CO<sub>2</sub> were 'Deep-fry' and 'Stir-fry', whereas 'Boil'

and 'Steam' showed high levels of LC CO<sub>2</sub>. Looking at the level of LC CO<sub>2</sub> combined from ingredients and cooking, breakfast showed the lowest LC CO<sub>2</sub> among the selected menus. Japanese style dinner showed a low level of LC CO<sub>2</sub> from ingredients, but a high level of LC CO<sub>2</sub> from cooking. As for Western style dinner, beef used for hamburger steak produced a much higher level of LC CO<sub>2</sub> based on an accumulated method. Therefore, the Western style dinner produced an LC CO<sub>2</sub> approximately twice as high as Japanese style or Chinese style dinners.

**Conclusions.** This study estimated the LC CO<sub>2</sub> emission from the selected menu of home cooking. To analyze the environmental burden of Japanese food life style more realistically, it is necessary to study environmental burden from meals eaten at restaurants and dishes using prepared or processed food, even when cooking utilizes statistics of average Japanese eating behavior models at home. The volume of CO<sub>2</sub> discharged from cooking by one household is limited, although it becomes larger when taking the total number of Japanese households into account. It is evident that every household should concern the CO<sub>2</sub> emission from cooking since it could reduce the environmental burdens.

## Research Article

### Environmental Impact of Using Restaurant/Recreation Services

### Linkage between the Linked Input-Output Table for Environmental Analysis and LES Demand Function

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**Objective.** When we look at the consumption activities in the area of household accounts, our desire to be well off seems to cause a higher environmental load. Therefore, if the household

account tries to lighten the environmental load, it will have to be prepared to 'endure', that is, bearing the decrease of the utility level. If 'endurance' will not last long, it is important not

only to carry out the simple strategy of reducing the consuming amount, but beyond, to investigate a detailed device of how service consumptions should be. Regarding these discussions we developed a new analytical model with which we can evaluate the relationship between changes of utility level and environmental load as a consequence of the consumers' high use of services. In this study, we linked the environmental household accounts using an I-O model with consumer's demand function and analyzed the environmental effect of changes in consumption patterns from necessities to services.

**Results and Discussion.** According to the 1985-90-95 linked Input-Output table for environmental analysis in 1995, the Japanese per capita CO<sub>2</sub> emission induced by consumption activities increased by 1.3 times that which was found in 1985. In this study, firstly, we compared the environmental household account in each year and decomposed the change of per capita induced CO<sub>2</sub> emission into the effects of the consumption structure, income level and technological issue. From the decomposition analysis, we found that the larger portion of consumption expenditure is used for such services as recreational services, the higher the environmental load induced by household consumption becomes. Then, to clarify the factor of such findings, we estimated the demand function in the linear expenditure system (LES) and tried to find that the high use of services af-

fect the consumer's utility level, and then the environmental load induced by household consumption. As a result, eating out and using cooked food would decrease the total amount of environmental load while the increase in recreation demand would increase the load. In both cases, however, the utility per environmental load would increase and, especially in the latter case, the difference is clear.

**Conclusions.** The aim of this study is to investigate how to reduce the environmental load induced by consumers at a minimum endurance or, in other words, to attain a minimum reduction of the utility level. To evaluate the change of utility level resulting from the alternation in life-style, we expressed the changes in one's life-styles as 'subjective discount activity,' somewhat a non-conventional approach. Why does a consumer discount the market price subjectively? The key to the answer is that some variables other than ordinary expenditure items, such as 'time', are related to that activity. To save time, consumers discount market price subjectively. The discount rate is in proportion to the preference for saving time. From our model, we can conclude that the high use of services increases the environmental efficiency of the consumption behavior. In the future, however, we will expand our utility function and introduce time variable explicitly. Through such a study, we are able to know what type of lifestyle is appropriate to a 'sustainable consumption society'.

## Research Article

### Estimation of Global Warming Emissions Associated with a Pig Production System Involving Life Cycle Assessment

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**Objective.** The objective of this study was to evaluate the environmental impacts associated with pig production during the breeding and fattening stages using the Life Cycle Assessment method for a Japanese farm producing approximately 3000 pigs/year. Emissions of global warming gases, such as CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>, were investigated within the context of the processes related to feed production and transport, animal management of the breeding and fattening stages, and the treatment of livestock waste. The functional unit was taken as one kilogram of pig meat.

**Results and Discussion.** Emissions of CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> amounted to 4.07, 0.93 and 0.56 CO<sub>2</sub> eq./kg meat, respectively, giving a total of 5.57 kg-CO<sub>2</sub> eq./kg meat for these gases. The emissions associated with the pig-fattening stage were 5.02 kg-CO<sub>2</sub> eq./kg meat, which accounted for 90% of total emissions in the pig production system. Interestingly, 70% of emissions could

be attributed to feed production and transport processes, while only 8.6% of emissions could be attributed to activities related to animal management. Global warming gas emissions from processes related to feed production, feed transport and animal management consisted almost entirely of CO<sub>2</sub>, whereas CH<sub>4</sub> was associated mainly with animal management, and N<sub>2</sub>O with animal management and the production of feed raw materials.

**Conclusion.** The results show that emissions of global warming gases from feed production and transport were 2.75 and 1.14 kg-CO<sub>2</sub> eq./kg meat, respectively, and that this accounted for 50% and 20% of total emissions in the pig production system. Therefore, it is important to use feed with the lowest emission rates of global warming gases, and to decrease the distances over which the feed raw materials need to be transported in order to decrease the emissions of global warming gases.

**8th International Conference EcoBalance**

**10 to 12 December 2008, Tokyo, Japan**

**Website:** <http://www.sntt.or.jp/ecobalance8/>

**Contact name:** The Society of Non-Traditional Technology

**Themes** on the development of various eco-balance associated methods and practice toward eco-innovation will be given priority in this year's conference, studies relating to those issues are particularly welcome.

**Organized by:** The Institute for Life Cycle Assessment, Japan